

## TECHNOLOGY NEEDS/OPPORTUNITIES STATEMENT

### GLOVE BOX SIZE REDUCTION SYSTEM FOR PFP

**Identification No.:** RL-DD02

**Date:** October 2000

**Program:** Nuclear Material Stabilization

**OPS Office/Site:** Richland Operations Office/Hanford Site

**PBS No.:** RL-CP03

**Waste Stream:** TBD

**TSD Title:** TBD

**Operable Unit (if applicable):** N/A

**Waste Management Unit (if applicable):** N/A

**Facility:** Plutonium Finishing Plant (PFP)

#### **Priority Rating:**

This entry addresses the "Accelerated Cleanup: Paths to Closure (ACPC)" Priority:

- ☒ 1. Critical to the success of the ACPC.
- ☐ 2. Provides substantial benefit to ACPC projects (e.g., moderate to high life-cycle cost savings or risk reduction, increased likelihood of compliance, increased assurance to avoid schedule delays).
- ☐ 3. Provides opportunities for significant, but lower cost savings or risk reduction, and may reduce uncertainty in ACPC project success.

**Need Title:** Glove Box Size Reduction System for PFP.

**Need/Opportunity Category:** *Technology Need* -- There is no existing or currently identified technology capable of solving the Site's problem (i.e., technology gap exists, no baseline approach has been identified).

**Need Description:** An ex-situ glove box size reduction system, possibly housed in a skid-mounted, modular containment structure is needed for PFP. The system would provide for size reduction, final decontamination, NDA, and packaging. The system should easily couple to a facility's support services, such as steam, water, air, and electricity. The system could potentially employ technology as identified in Need Statements RL-DD03 and RL-DD04. The system should not be limited to handling glove boxes but should also be applicable to other large items such as piping, ducting, and other metal objects.

#### **Schedule Requirements:**

Earliest Date Required: 09/2004

Latest Date Required: 09/2006

Although schedules for selection and installation are not firm, initial selection of the technology should occur in early 2002. The size reduction system will be used in a variety of roles during terminal cleanout and decontamination and decommissioning phases scheduled for FY 2005 through FY 2014. Deployment should occur as early as possible to maximize the benefits from the technology.

***Problem Description:*** Contamination represents an immediate worker exposure and risk concern as well as a long-term environmental concern. Many surface decontamination technologies generate secondary waste streams and are labor intensive and costly.

- a) **Glove Boxes** - Glove boxes have been used to handle radioactive materials for numerous activities. Present decontamination methods rely on personnel physically wiping surfaces. Worker fatigue, exposure, and risk are inherent in these methods. Complete decontamination of glove boxes using these methods is difficult because many surfaces are inaccessible using manual decontamination techniques.
- b) **Piping and Ducting** - Plutonium exists in piping and ductwork in materials processing facilities. The current practice for removing and stabilizing plutonium in pipes and ductwork involves personnel physically cutting the materials, bagging them, and transferring them to glove boxes for decontamination and size reduction. The process is time consuming, costly, and poses a risk of personnel exposure. The waste must be managed as a TRU waste, high-level waste, and/or low-level waste.
- c) **Other Metal Objects** - There are many metal objects that require decontamination. These include glove box equipment such as pipes, tanks, valves, motors, and flanges. Contaminants include plutonium oxide, other transuranics, and variety of tri-butyl phosphate-based organic compounds and degradation products.

***Potential Life-Cycle Cost Savings of Need (in \$000s) and Cost Savings Explanation:***

The potential life cycle cost savings of an automated, remote handling and size reduction system over manual techniques, requiring hands on operations are on a order of magnitude basis in the tens of millions of dollars. There are hundreds of gloveboxes on the Hanford site to be dealt with, and large numbers of other oversize equipment, as well as many thousands of feet of HVAC ducting and piping systems.

***Benefit to the Project Baseline of Filling Need:*** There is a significant potential to accelerate or provide better potentials to meet schedules for deactivation of facilities at the site.

***Relevant PBS Milestone:*** TRP-14-401, Complete PFP Deactivation, 9/30/16

***Functional Performance Requirements:*** Lessons-learned from previous plutonium (Pu) glovebox Deactivation/Decommissioning Projects indicate a preference to performing an initial gross decontamination in situ to remove the majority of plutonium, focusing on

ease of decontamination and high Pu holdup equipment. The glove box would then be packaged, disconnected from facility services, and transported to the ex situ system where final size reduction, decontamination, nondestructive analysis (NDA), and packaging activities would take place. Readily deployable robotics may also be appropriate to minimize worker exposure and risk. Methods that clean to non-transuranic (non-TRU) levels are preferable. Specific applications include the following:

- a) **Glove Boxes** - The primary contaminant is plutonium oxide. Glove boxes contain multiple materials requiring decontamination such as metals in a variety of shapes and sizes. Many of the surfaces are inaccessible using manual decontamination techniques.
- b) **Piping and Ducting** - The primary contaminant is plutonium oxide. The present method is to contain the piping/ducting and remove it for disposal (usually TRU). The “Decon/Size Reduction System” could serve as a receiver of this type of material as well.
- c) **Other Metal Objects** - The primary contaminant is plutonium oxide. Objects requiring decontamination include stainless-steel equipment of varying size but small enough to fit in a nominally-sized glove box. Again, many of the surfaces are inaccessible using manual decontamination techniques.

**Work Breakdown  
Structure (WBS) No.:**

**TIP No.:**

1.4.5 – PFP

TRP-02-499

**Justification For Need:**

**Technical:** There are several hundred glove boxes at PFP that are potential candidates for disposal at WIPP. Current decontamination methods as applied to whole glove boxes would not be effective in reducing the volume of TRU waste for ultimate disposal as this level of cleaning increases worker exposure and risk, is slow and costly, and produces secondary waste. Size reduction would permit the separation of TRU from non-TRU waste and would provide smaller and more uniform objects for a more production-oriented final cleaning process.

**Regulatory:** Completion of PFP terminal clean-out to remove all waste materials to a disposition path.

**Environmental Safety & Health:** Radioactive contamination presents worker safety/exposure concerns.

**Cultural/Stakeholder Concerns:** A system for size reduction and decontamination will expedite the removal of TRU waste and also minimize the volume of non-TRU

waste material destined for onsite burial. This will help alleviate concerns expressed by several stakeholder groups.

***Other:*** None identified.

***Current Baseline Technology:*** While significant glovebox size reduction has not occurred on site to date, other sites have used manual methods employing extensive PPE and handheld saws and nibblers.

***End-User:*** Fluor Hanford Inc. Nuclear Materials Stabilization Project.

***Contractor Facility/Project Manager:*** George W. Jackson, Director, Nuclear Materials Stabilization Project, Fluor Hanford, Inc., (509) 373-6622

***Site Technical Point-of-Contact:*** M. W. Gibson, Fluor Hanford, Inc. (FH), (509) 373-4869, Fax (509) 372-0232, email [mark\\_w\\_Gibson@rl.gov](mailto:mark_w_Gibson@rl.gov)

***DOE End-User/Representative Point-of-Contact:*** Mark R. Hahn, DOE-RL, (509) 373-9872, Fax (509) 376-0695, [mark\\_r\\_hahn@rl.gov](mailto:mark_r_hahn@rl.gov)